

Guiding Chesapeake Bay Water Quality Restoration: Conducting Use Attainability Analyses (UAAs)

Background

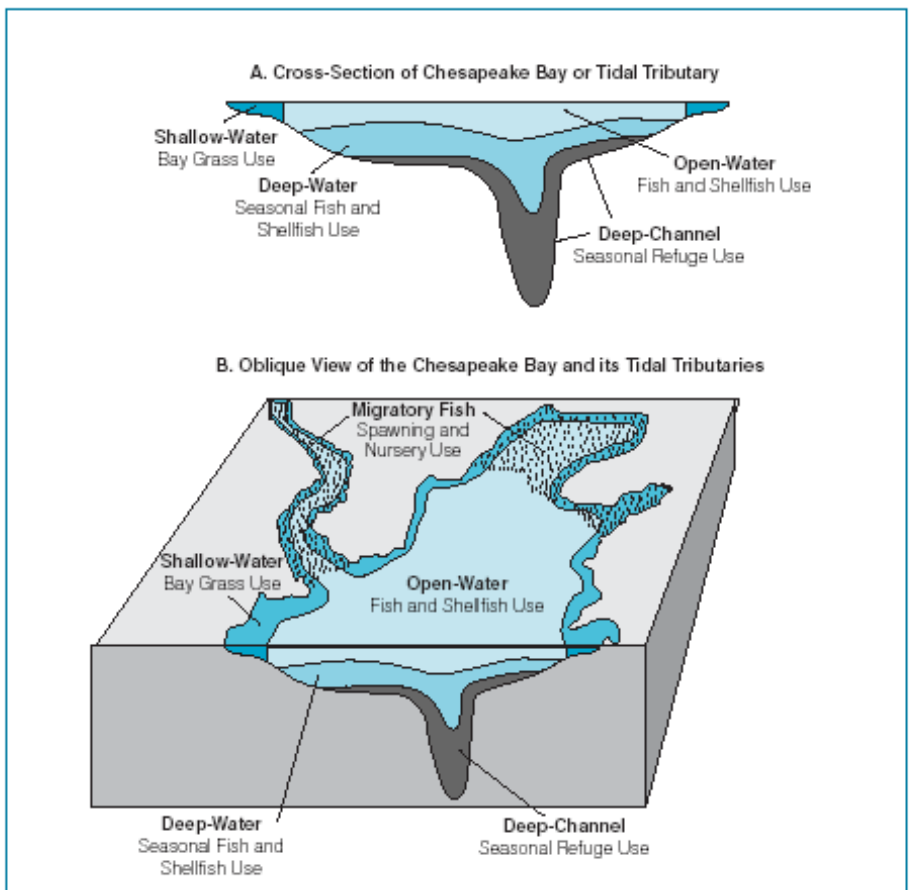
To improve water quality for the living resources of the Chesapeake Bay, the Chesapeake Bay Program partners—the U.S. Environmental Protection Agency (EPA), the states of Maryland, Virginia, Pennsylvania, New York, Delaware and West Virginia and the District of Columbia—have initiated a process to develop new water quality standards for the Bay and its tidal rivers. Maryland, Virginia, Delaware and the District of Columbia have committed to adopt their new state water quality standards by 2005.

A water quality standard defines the water quality goals of a water body, or portion thereof, in part, by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses. As part of the commitment to restore Chesapeake Bay water quality, the EPA, in close collaboration with its watershed partners, published new Chesapeake Bay regional water quality criteria for dissolved oxygen, water clarity and chlorophyll *a* in April 2003.

In developing new criteria, the partners also determined that the current underlying tidal-water designated uses must be refined to better reflect desired Chesapeake Bay water quality conditions. Current designated uses applied to the waters of the Chesapeake and its tidal tributaries do not fully reflect natural conditions and are too broad in their definition of ‘use’ to support the adoption of a more habitat-specific aquatic life criteria. Furthermore, they change across jurisdictional borders in the same body of water. Therefore, the Chesapeake Bay Program partners have recommended that the following five refined aquatic life designated uses be applied to the appropriate habitats in the Chesapeake Bay and its tidal tributaries:

- Migratory fish spawning and nursery;
- Open-water fish and shellfish;
- Deep-water seasonal fish and shellfish;
- Deep-channel seasonal refuge; and
- Shallow-water bay grass.

Conceptual illustration of the five recommended Chesapeake Bay tidal-water designated uses.



Use Attainability Analysis Defined

As part of their water quality standards development process, the states and the District of Columbia will conduct use attainability analyses (UAA). A UAA is a scientific study to assess the factors affecting the attainment of a use. The factors may be of a physical, chemical, biological and/or economic nature. The federal water quality standards regulation requires states to undertake UAAs to remove or establish a subcategory of a designated use that requires less stringent water quality criteria. The evaluations conducted in a UAA determine the attainable uses for a water body.

Evaluating Physical, Chemical and Biological Factors

The physical, chemical and biological factors affecting the attainment of a use are evaluated through a water body survey and assessment. Such surveys and assessments conducted by a state should be sufficiently detailed to answer the following questions:

- What are the aquatic use(s) currently being achieved in the water body?
- What are the causes of any impairment of the aquatic uses?
- What are the aquatic use(s) that can be attained based on the physical, chemical and biological characteristics of the water body?

When conducting surveys and assessments as part of a UAA, the EPA encourages states to use existing data to the greatest possible extent. Also, there are many analytical methods available that can be used by states as part of the survey and assessment process. States have the discretion to determine the appropriate parameters and methodologies as long as they are scientifically and technically supportable.

Summary of Typical Factors Used in Conducting a Water Body Survey and Assessment

<p>Physical Factors</p> <p>instream characteristics</p> <ul style="list-style-type: none"> -size (mean width./depth) -flow/velocity -annual hydrology -total volume -reaeration rates -gradient/pools/riffles -temperature -sedimentation -channel modifications -channel stability <p>substrate composition and characteristics</p> <p>channel debris</p> <p>sludge deposits</p> <p>riparian characteristics</p> <p>downstream characteristics</p>	<p>Chemical Factors</p> <p>dissolved oxygen</p> <p>toxicants</p> <p>suspended solids</p> <p>nutrients</p> <ul style="list-style-type: none"> -nitrogen -phosphorus <p>sediment oxygen demand</p> <p>salinity</p> <p>hardness</p> <p>alkalinity</p> <p>pH</p> <p>dissolved solids</p>	<p>Biological Factors</p> <p>biological inventory</p> <ul style="list-style-type: none"> -fish -macroinvertebrates -microinvertebrates -phytoplankton -periphyton -macrophytes <p>biological potential analysis</p> <ul style="list-style-type: none"> -diversity indices -HSI models -tissue analyses -recovery index -intolerant species analysis -omnivore-carnivore analysis <p>biological potential analysis</p> <ul style="list-style-type: none"> -reference reach comparison
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Physical Factors

Physical habitat plays an important role in the overall aquatic ecosystem and impacts the types and number of species present in a particular body of water. During the survey and assessment process, physical parameters of a water body are examined to identify factors that impair the propagation and protection of aquatic life and to determine what uses could be obtained in the water body given such limitations. In general, physical parameters such as flow, temperature, water depth, velocity, substrate, reaeration rates and other factors are used to preclude attainment of the designated use. Once any physical limitations have been identified, then a careful consideration of the ability to restore the physical integrity of the water is made. Such considerations may include whether it would cause more environmental damage to correct the problem than to leave the water as is, or whether physical impediments such as dams can be operated or modified in a way that would allow attainment of the use.

Chemical Evaluations

The chemical evaluation conducted during the survey and assessment process entails examining the chemical characteristics of a water body to determine why a designated use is not being met and to determine the potential of a particular species to survive in the water body if the concentrations of particular chemicals were modified. The type of parameters considered are determined by a state, but examples of the chemical factors that might be considered during this phase of the process include dissolved oxygen levels, suspended solids, salinity, alkalinity and nutrients. As part of the evaluation of water chemistry composition, a natural background evaluation is useful in determining the relative contribution of natural background contaminants to the water body. Determination that the natural background concentration of a pollutant is adversely impacting the survival of a species is a legitimate factor that effectively prevents a designated use from being met.

Biological Evaluations

In evaluating what aquatic life protection uses are attainable, the biology of the water body should be evaluated. The EPA encourages states to:

- provide a more precise statement of which species exist in the water body and should be protected;
- determine the biological health of the water body; and
- determine the species that could potentially exist in the water body if the physical and chemical factors impairing a use were corrected.

Before any field work is conducted, existing data should be collected. The EPA can provide data from intensive monitoring surveys and special studies. Data, especially for fish, may be available from state fish and game departments, or through environmental impact statements, permit reviews, surveys and academic or other studies.

Economic Factors

When evaluating use attainability, states may consider whether controls more stringent than those required by sections 301(b)(1)(A) and (B) and 306 of the Clean Water Act would result in substantial and widespread economic and social impacts. Although the EPA is responsible for approving a state's water quality standards, the state is responsible for interpreting the circumstances of each case and determining where there are substantial and widespread economic and social impacts, or where important social and economic development would be inappropriately precluded. Each analysis of economic impacts must demonstrate:

- that the polluting entity, whether privately or publicly owned, would face substantial financial impacts due to the costs of the necessary pollution controls and
- that the affected community would bear significant adverse impacts if the entity is required to meet existing or proposed water quality standards.

For public-sector entities, substantial impacts include financial impacts on the community, taking into consideration current socioeconomic conditions. Widespread, on the other hand, refers to changes in the community's socioeconomic conditions. By contrast, for private-sector entities, substantial impacts refer to financial impacts and widespread impacts refer to socioeconomic impacts on the surrounding community.

UAA Resources for Chesapeake Bay Program Watershed Partners

Technical Support Document

While a UAA is conducted by a state in the course of adopting new or revised water quality standards, the Chesapeake Bay Program developed a document entitled *Technical Support Document for Identification of Chesapeake Bay Designated Uses and Attainability (Technical Support Document)* that provides information on a watershed-wide scale to promote coordination and consistency across all jurisdictions. The *Technical Support Document* provides guidance for refining current designated uses—the five uses listed on the first page of this fact sheet—and it documents that two factors, natural conditions and human-caused conditions that cannot be remedied, are likely to be sufficient justification for showing why the current designated uses cannot be met, particularly in the deeper waters of the Chesapeake Bay.

The *Technical Support Document* is a compilation of basinwide guidance on UAA-related analyses and was assembled collaboratively by the relevant jurisdictions; it does not represent a regulation or a set of mandatory requirements. The EPA encourages jurisdictions to use the information in the *Technical Support Document* and, when appropriate, to perform additional analyses relevant to their respective water quality standards development process.

The *Technical Support Document* can be found online at: www.chesapeakebay.net/uasupport.htm. Hard copies can be obtained by contacting Lois Gartner at 410-267-5748.

Economic Analyses

As a companion piece to the *Technical Support Document*, the EPA developed a document entitled *Economic Analyses of Nutrient and Sediment Reduction Actions to Restore Chesapeake Bay Water Quality (Economic Analyses)*. The *Economic Analyses* provide states with the results of analyses conducted by the Chesapeake Bay Program related to controls to meet the revised water quality criteria and uses. Part I of the *Economic Analyses* provides estimates of the potential control costs associated with three modeling scenarios of nutrient reduction measures. Part II describes economic modeling of the potential impacts of these control costs in the Chesapeake Bay Region. Part III documents a screening-level analysis of potential impacts, also based on the costs of the tier scenarios. Although this information may be useful to states in conducting their own UAAs, the Chesapeake Bay Program did not use these analyses to delineate boundaries for the refined designated uses.

The *Economic Analyses* can be found online at: www.chesapeakebay.net/eoanalyses.htm.

Other Resources

Water Quality Standards Handbook (Second Edition) available online at: www.epa.gov/waterscience/standards/handbook.

Interim Economic Guidance for Water Quality Standards—Workbook available online at: www.epa.gov/waterscience/econ/.

Technical Support Manual: Waterbody Surveys and Assessments for Conducting Use Attainability Analyses, Volume I and *Technical Support Manual: Estuarine Systems, Volume II* both available online at: www.epa.gov/waterscience/library/wqstandards/uaavol123.pdf.